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APPLICATION FOR LETTERS PATENT

**Dynamically Displaying Current Status of Tasks**

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1 **RELATED APPLICATIONS**

2 A claim of priority is made to U.S. Provisional Application No. 60/240,685,  
3 filed October 16, 2000, entitled "Method for Dynamically Displaying the Current  
4 Status of Tasks".  
5

6 **TECHNICAL FIELD**

7 The present invention is directed to graphical user interfaces and more  
8 particularly to dynamically displaying the current status of tasks.  
9

10 **BACKGROUND**

11 As computers become increasingly powerful and commonplace, they are  
12 being used for an increasingly broad variety of tasks. For example, in addition to  
13 traditional activities such as running word processing and database applications,  
14 computers are increasingly becoming an integral part of users' daily lives.  
15 Programs to schedule activities, generate reminders, and provide rapid  
16 communication capabilities are becoming increasingly popular. Moreover,  
17 computers are increasingly present during virtually all of a person's daily  
18 activities. For example, hand-held computer organizers (e.g., PDAs) are  
19 increasingly common, and communication devices such as portable phones are  
20 increasingly incorporating computer capabilities. More recently, the field of  
21 wearable computers (e.g., with eyeglass displays) has begun to expand, creating a  
22 further presence of computers in people's daily lives.

23 Computers often progress through a particular series of steps when  
24 allowing a user to accomplish a particular task. For example, if a user desires to  
25 enter a new name and address to an electronic address book, the computer

1 progresses through a series of steps prompting the user to enter the desired  
2 information (e.g., name, street address, city, state, zip code, phone number, etc.).  
3 On computers with large displays (e.g., typical desktop computers), sufficient area  
4 exists on the display to provide an informative and useable user interface (UI) that  
5 allows the user to enter the necessary data for the series of steps. However,  
6 problems exist when attempting to guide the user through the particular series of  
7 steps on smaller displays. Without the large display area, there is frequently  
8 insufficient room to provide the prompts in the same informative and useable  
9 manner.

10 Additionally, the nature of many new computing devices with small  
11 displays (e.g., PDAs and wearable computers) is that the computing devices are  
12 transported with the user. However, traditional computer programs are not  
13 typically designed to efficiently present information to users in a wide variety of  
14 environments. For example, most computer programs are designed with a  
15 prototypical user being seated at a stationary computer with a large display device,  
16 and with the user devoting full attention to the display. In that environment, the  
17 computer program can be designed with the assumption that the user's attention is  
18 predominately on the display device. However, many new computing devices  
19 with small displays can be used when the user's attention is more likely to be  
20 diverted to some other task (e.g., driving, using machinery, walking, etc.). Many  
21 traditional computer programs, designed with large display devices in mind,  
22 frequently do not allow the user to quickly and easily reorient him-or her-self to  
23 the task being carried out by the computer. For example, if the user is performing  
24 a task by following a series of steps on a wearable computer, looks away from the  
25 display to focus his or her attention on crossing a busy intersection, and then

1 returns to the task, it would be desirable for the user to be able to quickly and  
2 easily reorient him- or her-self to the task (in other words, readily know what steps  
3 he or she has accomplished so far and what the next step to be performed is).

4 Accordingly, there is a need for new techniques to display the current status  
5 of tasks to a user.

## 6 7 SUMMARY

8 Dynamically displaying current status of tasks is described herein.

9 According to one aspect, a list of items corresponding to tasks that are to be  
10 performed are displayed. The tasks may be performed by a user (e.g., data entered  
11 by the user, words spoken by the user, actions taken by the user, and so forth) or  
12 alternatively by a computer (e.g., the steps followed in carrying out a programmed  
13 task). At least a portion of the list is displayed at any given time along with an  
14 indication of which task is the next task to be performed. As the user progresses  
15 through the set of tasks, the current status of his or her progression through the  
16 corresponding items on the list is dynamically updated so as to readily inform the  
17 user (or someone else) as to what the current task is that needs to be performed, as  
18 well as what tasks have already been performed and/or what tasks remain to be  
19 performed.

20 According to another aspect, only a subset of the list of items is displayed  
21 at any given time. The list is scrolled through as the tasks are performed so that  
22 different items are displayed as part of the subset as tasks are performed.

23 According to another aspect, multiple lists of tasks to be performed by  
24 multiple individuals (or computing devices) are displayed on a display of the user.  
25 As the multiple individuals (or computing devices) finish the tasks in their



Fig. 9 illustrates an exemplary group of lists that may be displayed for the distributed environment of Fig. 8.

#### **DETAILED DESCRIPTION**

Dynamically displaying the current status of tasks is described herein. A list of items or prompts that is to be traversed by a user in a particular order is displayed to the user (e.g., a set of tasks the user is to perform in a particular sequence as part of his or her job, a set of words to be spoken, a list of questions or fields to be answered, and so forth). At least a portion of the list is displayed at any given time along with an indication of which item in the list is the next item that the user needs to handle (e.g., the next task to perform, the next word to speak, the next question to answer, and so forth). As the user progresses through the list of tasks, the current status of his or her progression through the prompts on the list is dynamically updated so as to readily inform the user as to what the current task is that needs to be performed, as well as what tasks have already been performed and/or what tasks remain to be performed.

Fig. 1 illustrates an exemplary computing device 100 such as may be used in accordance with certain embodiments of the invention. Computing device 100 represents a wide variety of computing devices, such as wearable computers, personal digital assistants (PDAs), handheld or pocket computers, telephones (e.g., cell phones), laptop computers, gaming consoles or portable gaming devices, desktop computers, Internet appliances, etc. Although the dynamic displaying of current status of tasks described herein is particularly useful if computing device 100 has a small display, any size display may be used with the invention.



1 simultaneously overlaying or otherwise presenting information to the user in an  
2 unobtrusive manner), a speaker, an olfactory output device, tactile output devices,  
3 and so forth.

4 One or more application programs 118 are stored in memory 104 and  
5 executed by CPU 102. When executed, application programs 118 generate data  
6 that may be output to the user via one or more of the output devices 116 and also  
7 receive data that may be input by the user via one or more of the input devices  
8 114. For discussion purposes, one particular application program is illustrated  
9 with a user interface (UI) component 120 that is designed to present information to  
10 the user including dynamically displaying the current status of tasks as discussed  
11 in more detail below.

12 Although discussed herein primarily with reference to software components  
13 and modules, the invention may be implemented in hardware or a combination of  
14 hardware, software, and/or firmware. For example, one or more application  
15 specific integrated circuits (ASICs) could be designed or programmed to carry out  
16 the invention.

17 Fig. 2 illustrates an exemplary user interface display in accordance with  
18 certain embodiments of the invention. User interface display 150 can be, for  
19 example, the display generated by user interface 120 of Fig. 1. UI display 150  
20 includes an item or prompt list portion 152, a user choices portion 154, and an  
21 applet window portion 156. Additional labels or prompts 158 may also be  
22 included (e.g., a title for the task being handled, the current time, the amount of  
23 time left to finish the task, etc.). List portion 152 displays a list that prompts the  
24 user of tasks that are to be handled by the user in a particular order. An indication  
25 is also made to the user within list portion 152 of where the user currently is in



1 that list (that is, what the next item or task is that needs to be handled by the user),  
2 and also identifies items or tasks (if any) that have already been handled by the  
3 user as well as future items or tasks (if any) that need to be handled by the user.  
4 The manner in which an item or task is handled by the user is dependent on the  
5 nature of the list, as discussed in more detail below.

6 User choices portion 154 displays the options for the user to select from  
7 based on the next item or task in the list that needs to be handled by the user. For  
8 example, assume that the list in portion 152 is a list prompting the user regarding  
9 what information needs to be gathered in order for the user to set up a meeting  
10 with a potential customer. The list of prompts in list portion 152 could be a list of  
11 tasks the user must perform – that is, a list of information that needs to be  
12 collected (e.g., the customer's name, the location of the meeting, the time of the  
13 meeting, and so forth). If we further assume that the current task that needs to be  
14 handled by the user is entry of the location of the meeting, user choices portion  
15 154 could display the various permissible inputs for the location of the meeting  
16 (e.g., at the user's main office, at a remote office, at the customer's facility, and so  
17 forth).

18 By way of another example, the item list may be a list of prompts for the  
19 information to be verbally input by the user in each step, with user choices portion  
20 154 displaying a list of which words can be spoken in each step.

21 Applet window portion 156 displays additional information clarifying or  
22 amplifying the choices in user choices portion 154 (or the current item or task in  
23 item list portion 152). Following the previous example, if the current task that  
24 needs to be handled by the user is entry of the location of the meeting, applet  
25 window portion 156 could display additional descriptive information for one or



1 words, the user is also able to obtain a feel for where he or she is (or where the  
2 user or computer being monitored is) in progressing through the sequence of  
3 tasks). The user is able to quickly identify one or more previous tasks (if any) in  
4 the sequence, as well as one or more future tasks (if any) in the sequence. Such  
5 information is particularly helpful in reorienting the user to the sequence of tasks  
6 if his or her attention has been diverted away from the sequence. For example, the  
7 user's attention may be diverted away from the sequence to answer questions from  
8 another employee. After answering the question, the user can look back at display  
9 150 and quickly reorient him- or her-self into the sequence of tasks being  
10 performed.

11 Item lists may be a set of predetermined items, such as a particular set of  
12 steps to be followed to assemble a machine or a set of words to be uttered to carry  
13 out a task for a speech-recognizing computer. Alternatively, item lists may be  
14 dynamic, changing based on the user's current location, current activity, past  
15 behavior, etc. For example, computer 100 of Fig. 1 may detect where the user is  
16 currently located (e.g., in his or her office, in the assembly plant, which assembly  
17 plant, etc.), and provide the appropriate instructions to perform a particular task  
18 based on that current location. Additional information regarding detecting the  
19 user's current context (e.g., current location, current activity, etc.) can be found in  
20 a co-pending U.S. Patent Application Serial No. 09/216,193, entitled "Method and  
21 System For Controlling Presentation of Information To a User Based On The  
22 User's Condition", which was filed December 18, 1998, and is commonly  
23 assigned to Tangis Corporation. This application is hereby incorporated by  
24 reference.  
25



1 be altered (e.g., a different color, a different font, a different size, a different  
2 position on screen (e.g., slightly higher or lower than other prompts in the list),  
3 and so forth), the display around the prompt may be altered (e.g., the prompt may  
4 be inverted so that it appears white on a black background rather than the more  
5 traditional black on a white background, the prompt may be highlighted, the  
6 prompt may be encircled by a border, and so forth), etc. Those skilled in the art  
7 can easily determine a variety of alternate methods for marking the current step.

8 One additional presentation change that can be made to distinguish the  
9 current step from other steps in the sequence is to change the prompt itself. The  
10 prompt could be replaced with another prompt, or another prompt could be  
11 superimposed on the prompt for the current step. For example, the user may have  
12 a set of individuals that he or she typically meets with, and these may be  
13 superimposed on the "who?" prompt when it is the current step. Figs. 4A – 4B  
14 illustrates different ways in which the prompt in a sequence can be changed. Fig.  
15 4A illustrates an example item list with the prompt for the current step in the  
16 sequence being superimposed with various input options. A list 190 is illustrated  
17 and the current step is to input who the meeting is to be with (the "who?" prompt).  
18 As illustrated, a set of common people that the user schedules meetings with (Jane,  
19 David, Lisa, and Richard) are superimposed on the "who?" prompt. The  
20 appearance of the underlying prompt "who?" may be changed (e.g., shadowed out,  
21 different color, etc.) in order for overlying input options to be more easily viewed.  
22 It is to be appreciated that the exact location of the superimposed set of input  
23 options can vary (e.g., the characters of one or more input options may overlap the  
24 prompt, or be separated from the prompt).

Fig. 4B illustrates an example item list with the prompt for the current step in the sequence being replaced by the set of input options. A list 192 is illustrated and the current step is to input who the meeting is to be with (the "who?" prompt). However, as illustrated, the "who?" prompt is replaced with a set of common people that the user schedules meetings with (Jane, David, Lisa, and Richard).

The user is thus given an indication of both the current step in the sequence as well as common responses to that step. The type of information that is superimposed on or replaces the prompt can vary based on the current step. For example, when the "when?" prompt is the current step it may have superimposed thereon the times that the user is available for the current day (or current week, and so forth).

Returning to Fig. 3, once the user enters the information identifying who the meeting is with (assume for purposes of this example the meeting is with Bob Smith), list 170 is changed to list 174 in which the prompt "who?" is replaced with the name "Bob Smith" and the current location marker 172 is changed to indicate the next prompt ("when?") is the current task that needs to be handled by the user. Assuming the user inputs that the meeting is to occur at 10am on October 31, list 174 is changed to list 176 in which the prompt "when?" is replaced with the date and time of the meeting, and the current location marker 172 is changed to indicate the next prompt ("how long?") is the current task that needs to be handled by the user. Thus, as can be seen from lists 172, 174, and 176, the current location marker 172 "bounces" along the list from item to item, making the user readily aware of what the current task is that he or she should be performing (that is, which data he or she should be inputting in the present example).



1 the user as the entire sequence of idioms "who?", "when?", "how long?",  
2 "where?", and "bring?".

3 The use of item lists as described herein also allows an individual to  
4 "zoom" in on (and thus gain more information about) a particular task. For  
5 example, with reference to Fig. 3, the user is able to select and zoom in on the  
6 "where?" prompt and have additional information about that task displayed (e.g.,  
7 the possible locations for the meeting). The user is able to "backtrack" through the  
8 list (e.g., by moving a cursor to the desired item and selecting it, or using a back  
9 arrow key or icon, or changing the current location marker (e.g., dragging and  
10 dropping the location marker to the desired item), etc.) and see this additional  
11 information for tasks already completed. Alternatively, the "backtracking" may be  
12 for navigational rather than informational purposes. Moving back through the list  
13 (whether by manipulation of the location marker or in some other manner) may  
14 also be used to accomplish other types of operations, such as defining a macro or  
15 annotation.

16 Additionally, by displaying the prompts for future items, the speed of  
17 handling of the sequence of the items by the user can potentially be increased. For  
18 example, the user can see the prompt for the next one or more items in the list and  
19 begin thinking about how he or she is going to handle that particular item even  
20 before the computing device is finished processing the input for the item he or she  
21 just handled.

22 According to another embodiment, multiple location markers are displayed  
23 along with the item list – one marker identifying the current item to be handled by  
24 the user and another marker identifying the current item being processed by the  
25 computing device. Situations can arise where the user can input data quicker than



1 it can be processed by the computing device. For example, the user may be able to  
2 talk at a faster rate than the computing device is able to analyze the speech.

3 The use of two such markers can allow the user to identify if the computing  
4 device is hung up on or having difficulty processing a particular input (e.g.,  
5 identify a particular word spoken by the user, misrecognition of the input,  
6 improper parsing, etc.), the user can identify this situation and go back to the task  
7 the computing device is having difficulty processing and re-enter the speech.

8 Fig. 5 is a flowchart illustrating an exemplary process for displaying the  
9 current status of tasks in accordance with certain embodiments of the invention.  
10 The process of Fig. 5 is carried out by the user interface of a computing device  
11 (e.g., interface 120 of Fig. 1), and may be performed in software. Although Fig. 5  
12 is discussed with reference to a location marker, it is to be appreciated that any of  
13 the presentation changes discussed above can be used to identify items in the list.

14 Initially, an item list is displayed (act 200), which is a sequence of items or  
15 prompts for the user to follow. A current location marker is also displayed to  
16 identify the first item in the list (act 202), and input corresponding to the first item  
17 in the list is received (act 204). The nature of this input can vary depending on the  
18 sequence of tasks itself (e.g., it may be data input by a user, an indication from  
19 another computer program that the task has been accomplished, etc.). A check is  
20 then made as to whether the end of the list has been reached (at 206). If the end of  
21 the list has been reached then the process stops (act 208), waiting for the next  
22 sequence of tasks to begin or for the user to backtrack to a previously completed  
23 task.

24 However, if the end of the list has not been reached, then a check is made  
25 as to whether scrolling of the list is needed (act 210). Whether scrolling of the list

1 is needed can be based on a variety of different factors. For example, the user  
2 interface may attempt to make sure that there are always at least a threshold  
3 number of prompts before and/or after the current location marker, the user  
4 interface may attempt to make sure that the current task remains as close to the  
5 center of the item list as is possible but that no portions of the item list be left  
6 empty, etc. These factors can optionally be user-configurable preferences,  
7 allowing the user to adjust the display to his or her particular likes and/or dislikes  
8 (e.g., the user may prefer to see more future tasks than previous tasks).

9 If scrolling is needed, then the item list is scrolled by one item (or  
10 alternatively more items) in the appropriate direction (act 212). The amount that  
11 the item list is scrolled can vary (e.g., based on the sizes of the different items in  
12 the list). The appropriate direction for scrolling can vary based on the activity  
13 being performed by the user and the layout of the list (e.g., in the example of Fig.  
14 3, the scrolling is from right to left when progressing forward through the list, and  
15 left to right when backtracking through the list). Regardless of whether the  
16 ordered item list is scrolled, after act 210 or 212 the current location marker is  
17 moved as necessary to identify the next item in the list that is to be handled by the  
18 user (act 214). In some situations, movement of the current location marker may  
19 not be necessary due to the scrolling performed (e.g., as illustrated with reference  
20 to lists 176 and 178 in Fig. 3). At some point after the current location marker is  
21 moved (if necessary), user input is received corresponding to the identified next  
22 item in the list (act 216). The process then returns to determine whether the end of  
23 the list has been reached (act 206).

24 The item list and current location identifier or marker can be displayed in a  
25 wide variety of different manners. Figs. 6 and 7 illustrate alternative displays of

1 the item list and current location identifiers with reference to a sequence of tasks  
2 to be completed in order to record a new inspection (e.g., a building inspection).  
3 In the exemplary display 240 of Fig. 6, an item list portion 242 and an applet  
4 window portion 244 are illustrated. The item list portion 242 includes a list of  
5 tasks that are to be handled by the user, each of which is information to be entered  
6 by the user. Once entered, the information is displayed in applet window portion  
7 244. A current location marker 246 advances down the list in portion 242 to  
8 identify the current information that the user needs to input (the customer's state in  
9 the illustrated display). Additional information is displayed at the top of display  
10 240, including a prompt 248 identifying a type of information being entered by the  
11 user (inspection information).

12 In the exemplary display 260 of Fig. 7, a multi-tiered item list is displayed  
13 including list portion 262 and list portion 264. In list portion 262, prompts for the  
14 overall process of recording a new inspection are listed, including selecting a new  
15 inspection option and then entering inspection information. Two current location  
16 markers 266 and 268 are illustrated, each providing a visual indication of where in  
17 the overall process the current user is (inspection info in the illustrated display). A  
18 prompt 270 provides a further identification to the user of where he or she is in the  
19 overall process. List portion 264 includes prompts for the process of entering  
20 inspection information, with a current location marker 272 providing a visual  
21 indication of where in the inspection information entry process the user currently  
22 is (customer state in the illustrated display).

23 In addition to tracking the status of tasks being performed by a single user,  
24 the dynamic displaying of the current status of tasks of the present invention can  
25 further be used to track the status of tasks being performed by multiple users. In



Fig. 9 illustrates an exemplary group of lists that may be displayed on eyeglass display 308 of Fig. 8. Assume that each of the users John, Jamie, Max, and Carol are each performing a machine assembly process involving the following tasks: inventory the necessary parts, assemble an intake, lubricate a core part of the machine, install the assembled intake, verify that the batteries are fully charged, and then run a diagnostic program. The tasks in the machine assembly process are illustrated in a portion 310 of display 308 in an abbreviated form. Alternatively, the tasks illustrated in portion 310 may not be abbreviated, or may be represented in some other manner (e.g., as icons). A separate item list is displayed on display 308 for each of the users along with a corresponding current location marker in the shape of a ball or circle. Thus, as illustrated in Fig. 9, the viewer of display 308 can readily identify that John is at the "assemble intake" step, Jamie and Max are both at the "install intake" step, and Carol is at the "verify charge" step. Thus, the supervisor viewing display 308 can quickly and easily determine, based on the item list and current location markers, that each of Jamie, Max, and Carol is proceeding normally through the assembly process, but that John is hung up on the "assemble intake" step, so the supervisor can check with John to see if he is experiencing difficulties with this step.

### Conclusion

Although the description above uses language that is specific to structural features and/or methodological acts, it is to be understood that the invention defined in the appended claims is not limited to the specific features or acts described. Rather, the specific features and acts are disclosed as exemplary forms of implementing the invention.